JOURNAL OF APPLIED BEHAVIOR ANALYSIS 1998, **31,** 713–716 NUMBER 4 (WINTER 1998)

PROGRESS IN LEARNING: *A REVIEW OF CATANIA'S 4TH EDITION*

F. CHARLES MACE, JOHN C. BORRERO, JAMES E. CONNELL, MELISSA CONNELLY, BETH A. DELANEY, ELISSA MCLAUGHLIN-CHENG, ROCCO L. NOCERA, PATRICK R. PROGAR, JOEL E. RINGDAHL, BARBARA J. SIERP, AND JIN HO YOON

UNIVERSITY OF PENNSYLVANIA AND CHILDREN'S SEASHORE HOUSE

The first edition of A. C. Catania's *Learning* was published in 1979. Since that time, it has been a leading textbook for courses on learning and motivation, as well as a resource book for basic and applied researchers. One impetus for writing the first edition was the need to update Keller and Schoenfeld's comprehensive text, *Principles of Psychology,* which was published in 1950. Keller and Schoenfeld not only presented what was known at the time about respondent and operant conditioning and related concepts but also entered into experimentally less charted waters on topics such as motivation, emotion, and social behavior (e.g., personality, verbal behavior, consciousness, and understanding). The net effect was to place the science of behavior at the center of psychology by providing a cohesive account of a wide spectrum of topics in psychology from the perspective of a science of behavior. Catania continued this example in the first and subsequent editions of *Learning,* illustrating that virtually no topic in psychology is outside the scope of behavior analysis.

Catania's (1998) text remains the most comprehensive and authoritative treatment of the subject available. So, for readers looking for their first text on learning, this review strongly recommends the fourth edition of *Learning.* But for those of us who have an earlier edition, the important question is whether this latest version represents a substantive revision. To address this question, we examined all four editions of *Learning* to see how the text has evolved in terms of organization, the topics covered, the literature cited, and the pedagogical tools employed.

Organization, Topics Covered, and Literature Cited

The subject addressed in the text has remained the same. Catania provides a broad view and treatment of learning, one that spans a wide range of topics from animal learning and conditioning to human cognition, memory, and language. This comprehensive approach to learning explicitly connects two historically disconnected literatures that evolved separate terminologies and research methodologies. The broad scope brings behavior analysts into contact with topics and literature that are often ignored. More important, it demonstrates that even the most complex human behavior can be understood and addressed within a behavior-analytic framework.

The first two editions of *Learning* contained 15 and 14 chapters, respectively, that were not organized by general themes. The third edition was expanded to 16 chapters, and the fourth now has 21. Beginning with the third edition, and continued in the fourth, chapters are organized into five areas: an introduction to learning and behavior, behavior without learning, learning without words, learning with words, and concluding

Catania, A. C. (1998). *Learning* (4th ed.). Upper Saddle River, NJ: Prentice Hall.

Requests for reprints may be addressed to F. Charles Mace, School of Psychology, 43 College Road, University of Wales–Bangor, Gwynedd LL57 2DG, United Kingdom.

perspectives on structure and function in learning. The five additional chapters in the fourth edition represent a refinement of the book's organization more than the addition of new topics. For example, the chapter on reinforcement schedules was divided into two chapters, one on basic schedules and another on schedule combinations. Similarly, chapters on learning and behavior, discriminated operants, verbal behavior, and remembering have been expanded to two chapters each in the fourth edition. In general, we considered the increased number of chapters to improve the organization of the text. The chapters affected, long and densely packed in the third edition, are now more manageable for both students and instructors.

Although many of the topics covered remained constant from the third to the fourth edition, as might be expected with a scientific subject matter, there are also several new topics introduced in the latest version. Most additions are brief and are nested within sections existing in previous editions. Topics new to the fourth edition include fluency of skills, relational frame theory (the emergence of higher order, generalized classes of symbolic behavior), selection of the capacity to learn, mechanisms of learning in the nervous system, adduction (novel combinations of existing, typically verbal, repertoires), neuroscience research tools (e.g., PET scans) used to study the physiology of remembering, problems in remembering early childhood events, and facilitated communication.

Topics receiving expanded treatment (ranging from a few sentences to several paragraphs) include delay of reinforcement (in relation to fixed-interval schedules of reinforcement), equivalence classes and the origins of structure, verbal classes and naming, rule-governed and instructional control, artificial versus natural selection, discrimination of one's own verbal behavior, extrinsic versus intrinsic consequences, elicitation and conditional probabilities, feature-positive and feature-negative effects, applications of differential reinforcement (e.g., breast self-examination), basic reinforcement schedules, observing responses, conditioned reinforcement, observational learning, echoic and intraverbal behavior, shaping verbal behavior, verbal behavior and nonhuman language, and language development.

With 417 pages excluding references, the fourth edition is unquestionably a comprehensive text on learning. However, perhaps because the text's aims are high, we were disappointed not to see included some topics that have received substantial attention in the *Journal of the Experimental Analysis of Behavior* (*JEAB*) and the *Journal of Applied Behavior Analysis* (*JABA*), especially from 1990 to 1996. For purposes of this assessment, we defined *substantial attention* in two ways. First, both *JEAB* and *JABA* have published special issues or special sections that are thematic in nature. We assume that, in the judgment of the editors, selected topics are deemed important to the field. Most, though not all, of the special issue topics seem to be relevant to a text on learning. Our second test for *substantial attention* was more subjective. Based on discussions among ourselves and some informal surveys of colleagues, we generated a list of significant developments in both basic and applied behavior analysis that we considered important to cover in a comprehensive text on learning.

JEAB has published six special issues and one special article with 26 commentaries between 1990 and 1996. The topics addressed in these issues were the experimental analysis of human behavior, behavioral pharmacology, behavior dynamics, the nature of reinforcement, the contributions of Joseph V. Brady, behavioral economics, and the origins of naming and other symbolic behavior. Many of these topics are directly relevant to

learning. For example, the issue on the experimental analysis of human behavior demonstrated that many behavioral principles, well-established in pigeon and rat laboratories, are applicable to humans. The issues devoted to behavior dynamics, the nature of reinforcement, and behavioral economics address many topics included in Catania's text, but provide updated research and conceptualizations of key topics such as matching and maximizing, resistance to change, feedback functions, delay discounting, substitutability, autoshaping, and choice and the matching law, to name a few. Even the special issues on behavioral pharmacology and the contributions of Joseph V. Brady contain papers that illustrate the effects of various prescription and illicit drugs on stimulus control, schedule performance, and behavioral acquisition, and show how environmental contingencies can influence autonomic physiological responses such as blood pressure and respiration. The total number of papers published in these seven issues was 90. Five of these 90 studies were cited in the fourth edition of *Learning*.

JABA has published 14 special issues or sections containing 184 articles between 1990 and 1996. Topics of these issues included road safety; social validity; science, theory, and technology; behavioral community intervention; the education crisis; improving social competence; performance management for business, industry, sports, and exercise; behavioral pediatrics; school psychology; functional analysis; integrating basic and applied research; behavioral consultation; current societal concerns; and self-restraint. Although many of the articles in these issues do not pertain directly to behavioral processes involved in learning, several clearly do. For instance, many of the articles on functional analysis and integrating basic and applied research establish the generality or applicability of the matching law, behavioral contrast, extinction, behavioral momentum, generalized imitation, nodality effects during equivalence class formation, rule-governed insensitivity to contingencies, stimulus fading, and noncontingent reinforcement. Articles in the other special issues or sections that emphasize behavioral technologies per se would have made nice and current examples of the application of learning principles, a practice Catania has used increasingly with each succeeding edition. Unfortunately, none of these 184 *JABA* articles was cited in the fourth edition.

The following are, in our judgment, examples of some significant developments in the experimental analysis of behavior and applied behavior analysis that were not discussed in any detail in the fourth edition of *Learning*: applications of the matching law (Martens & Houk, 1989; Neef, Shade, & Miller, 1994), behavioral economics (Hursh, 1991), the generalized matching law (Baum, 1974), behavioral momentum (Nevin, Mandel, & Atak, 1983; Nevin, Tota, Torquato, & Shull, 1990), behavioral pharmacology (Bickel, DeGrandpre, Hughes, & Higgins, 1991), functional analysis of problem behavior (Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994), and noncontingent reinforcement as treatment for problem behavior (Vollmer, Iwata, Zarcone, Smith, & Mazaleski, 1993).

One more measure may objectively address this issue. Of the 853 references in the fourth edition, 64 (or 7.5%) were from papers published since the third edition (i.e., 1992). To be fair, *Learning* assumes a sizable responsibility to cover research findings that span the history of the science of behavior, many of which are relevant today. In our view, however, there was room to better reflect recent developments and research examples in the fourth edition.

Pedagogical Tools

The fourth edition of *Learning* is rich with useful pedagogical aids. The text con-

tains 81 figures and eight tables, all of which are excellent tools for clarifying concepts, illustrating research findings, or summarizing large quantities of facts. There were approximately the same number of figures and tables in the third edition. One table, deleted from the third edition and restored in the fourth, concisely summarizes schedule combinations and is a welcome addition to the book.

The glossary of terms was first introduced in the third edition. It has been expanded by 31 additional terms (e.g., adduction, augmenting stimulus, cultural selection, naming, ontogenic and phylogenic selection, and relational frame). There were also numerous revisions and additions to the definitions that provided clarity or detail. Catania's glossary continues to be one of the most authoritative definitions of scientific terms available to behavior analysts.

Finally, the text is made more user-friendly to students and instructors by the *Test-Item File,* available from the publisher, and a set of computer programs, *Behavior on a Disk,* that includes simulations of various behavioral processes, experiments in memory and verbal learning, and vocabulary review exercises.

Conclusion

Catania's fourth edition of *Learning* (1998) remains the most comprehensive and authoritative account of learning from a behavioral perspective. By bridging the separate literatures on animal learning and basic behavioral processes with research on human language, cognition, and memory, Catania shows his readers that there need not be separate psychologies for animals and humans. Catania employs an internally consistent approach to reasoning that convincingly illustrates that even the most complex types of human learning can be addressed from a radical behavioral approach. Catania's text stands alone among the competition in this regard, making it, in our view, the clear choice for students and behavioral scientists alike.

REFERENCES

Baum, W. M. (1974). On two types of deviation from the matching law: Bias and undermatching. *Journal of the Experimental Analysis of Behavior, 22,* 231–242.

Bickel, W. K., DeGrandpre, R. J., Hughes, J. R., & Higgins, S. T. (1991). Behavioral economics of drug self-administration. II. A unit-price analysis of cigarette smoking. *Journal of the Experimental Analysis of Behavior, 55,* 145–154.

Catania, A. C. (1998). *Learning* (4th ed.). Upper Saddle River, NJ: Prentice Hall.

Hursh, S. R. (1991). Behavioral economics of drug self-administration and drug abuse policy. *Journal of the Experimental Analysis of Behavior, 56,* 377–393.

Iwata, B. A., Dorsey, M. F., Slifer, K. J., Bauman, K. E., & Richman, G. S. (1994). Toward a functional analysis of self-injury. *Journal of Applied Behavior Analysis, 27,* 197–209. (Reprinted from *Analysis and Intervention in Developmental Disabilities, 2,* 3–20, 1982)

Keller, F. S., & Schoenfeld, W. N. (1950). *Principles of psychology.* New York: Appleton-Century-Crofts.

Martens, B. K., & Houk, J. L. (1989). The application of Herrnstein's law of effect to disruptive and on-task behavior of a retarded adolescent girl. *Journal of the Experimental Analysis of Behavior, 51,* 17–27.

Neef, N. A., Shade, D., & Miller, M. S. (1994). Assessing influential dimensions of reinforcers on choice in students with serious emotional disturbance. *Journal of Applied Behavior Analysis, 27,* 575–583.

Nevin, J. A., Mandell, C., & Atak, J. R. (1983). The analysis of behavioral momentum. *Journal of the Experimental Analysis of Behavior, 39,* 49–59.

Nevin, J. A., Tota, M. E., Torquato, R. D., & Shull, R. L. (1990). Alternative reinforcement increases resistance to change: Pavlovian or operant contingencies? *Journal of the Experimental Analysis of Behavior, 53,* 359–379.

Vollmer, T. R., Iwata, B. A., Zarcone, J. R., Smith, R. G., & Mazaleski, J. L. (1993). The role of attention in the treatment of attention-maintained self-injurious behavior: Noncontingent reinforcement and differential reinforcement of other behavior. *Journal of Applied Behavior Analysis, 26,* 9–21.

Received February 3, 1998
Final acceptance February 20, 1998
Action Editor, David P. Wacker